

# XIAOLAN XU

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## EXPERTISE

Expertise in the field of applied electromagnetics, electromagnetic wave propagation and scattering properties from ocean surface, vegetated land surface and snow covered terrain, forward modeling and retrieval algorithm development with applications to Earth remote sensing in space.

## EDUCATION

<b>University of Washington, Seattle, WA, USA</b>	09/2006 - 12/2011
<b>Ph. D.</b> in Electrical Engineering	
• Science Communication Fellow, Pacific Science Center (PSC)	
• Organizing Committee member, Progress in Electromagnetics Research Symposium (PIERS), Boston, 2010	
• Second Prize, Student Paper Competition, IEEE International Geoscience & Remote Sensing Symposium, Cape Town, South Africa, 2009	
<b>M. S.</b> in Electrical Engineering	09/2006 - 06/2008
• Cumulative GPA: 3.86/4.00	
<b>Zhejiang University, Hangzhou, Zhejiang, China</b>	09/2002 - 06/2006
<b>Bachelor of Engineering</b> in Electrical Engineering	
• Major GPA: 3.94/4.00	
• Member of Mixed Class (Honors Program of Engineering)	
• Member of Chu Kochen Honors College (Top 5% students)	
• Outstanding Bachelor Thesis	

## EMPLOYMENT

<b>Jet Propulsion Laboratory, Pasadena, CA, USA</b>	01/2012 - present
<b>Postdoctoral Fellow</b> , Engineering & Science Directorate	
• Algorithm Development for Soil Moisture Active Passive (SMAP) Satellite Mission	
• Post-launch Data Analysis for Aquarius Mission	
<b>University of Washington, Seattle, WA, USA</b>	09/2006 - 12/2011
<b>Research Assistant</b> , Laboratory of Applications and Computations in Electromagnetics and Optics (LACEO)	
• Extended dense media radiative theory to multilayer structure	
• Developed Foldy-Lax fast algorithm for multiple scattering of spheres	
• Implemented MoM-BOR code for axis symmetric structure with application on vegetation scattering	
• Enhanced hydrology models with data assimilation using active and passive microwave remote sensing	
• Improved forward physical scattering model for different land cover and ocean surface	
• Led research team in a series of field experiments	
○ Ground active and passive snow experiment, Mar. 2011	
○ Grand Mesa snow pre-season survey, Sep. 2010	
○ Grand Mesa snow in-season survey, Nov. 2010	
○ Ground active and passive snow experiment, Feb. 2009	
<b>Zhejiang University, Hangzhou, Zhejiang, China</b>	08/2004 - 06/2006
<b>Research Assistant</b> , Remote Sensing & Wireless Communication Lab	
• Developed models of ocean rough surface scattering (1D/2D)	

## TEACHING EXPERIENCE

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**University of Washington, Seattle, WA, USA**

Winter, 2011

**Lecturer**, Department of Electrical Engineering

- EE361 “Applied Electromagnetics”

**University of Washington, Seattle, WA, USA**

Spring, 2008

**Teaching Assistant**, Department of Electrical Engineering

- EE575 “Waves in Random Media”

## TECHNICAL SKILLS

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- Software: HFSS, Designer, CST, Cadence, Spice, ADS
- Programming: Matlab, C, FORTRAN, Java, LabVIEW
- Measurement: Network Analyzer, Spectrum Analyzer

## PUBLICATIONS

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### Journal Articles

Seung-bum Kim, Mahta Moghaddam, Leung Tsang, Mariko Burgin, **Xiaolan Xu**, Eni G. Njoku, “Models of L-band radar backscattering coefficients over the global terrain for soil moisture retrieval,” *Geoscience and Remote Sensing, IEEE Transactions on*, accepted, March, 2013.

Leung Tsang; K. H. Ding; S. Huang; **Xiaolan Xu**; , “Electromagnetic Computation in Scattering of Electromagnetic Waves by Random Rough Surface and Dense Media in Microwave Remote Sensing of Land Surfaces,” *Proceedings of IEEE, special issue paper*, accepted, July, 2012

**Xiaolan Xu**; L. Tsang; S. Yueh; , “Electromagnetic Models of Co/Cross-polarization of Bicontinuous/DMRT in Radar Remote Sensing of Terrestrial Snow at X- and Ku-band for CoReH2O and SCLP Applications,” *Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Journal of* , vol.5, no.3, pp.1024-1032, June 2012  
doi: 10.1109/JSTARS.2012.2190719

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6185696&isnumber=6227332>

**Xiaolan Xu**; Ding Liang; Leung Tsang; Andreadis, K.M.; Josberger, E.G.; Lettenmaier, D.P.; Cline, D.W.; Yueh, S.H.; , “Active Remote Sensing of Snow Using NMM3D/DMRT and Comparison With CLPX II Airborne Data,” *Selected Topics in Applied Earth Observations and Remote Sensing, IEEE Journal of* , vol.3, no.4, pp.689-697, Dec. 2010. doi: 10.1109/JSTARS.2010.2053919

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5549988&isnumber=5658191>

Kung-Hau Ding; **Xiaolan Xu**; Leung Tsang; , “Electromagnetic Scattering by Bicontinuous Random Microstructures With Discrete Permittivities,” *Geoscience and Remote Sensing, IEEE Transactions on* , vol.48, no.8, pp.3139-3151, Aug. 2010. doi: 10.1109/TGRS.2010.2043953

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5444898&isnumber=5510059>

Ding Liang; **Xiaolan Xu**; Leung Tsang; Andreadis, K.M.; Josberger, E.G.; , “The Effects of Layers in Dry Snow on Its Passive Microwave Emissions Using Dense Media Radiative Transfer Theory Based on the Quasicrystalline Approximation (QCA/DMRT),” *Geoscience and Remote Sensing, IEEE Transactions on* , vol.46, no.11, pp.3663-3671, Nov. 2008. doi: 10.1109/TGRS.2008.922143

URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4686016&isnumber=4686006>

Wenzhe Yan; **Xiaolan Xu**; Yang Du; F. Sheng, Z. N. N.; , “Two-scale Model for Composite Rough Surface Scattering,” *PIERS ONLINE*, Vol. 3, No. 5, 2007. doi:10.2529/PIERS061113040537

URL: [http://www.piersonline/piers.php?volume=3&number=5&page=718](http://www.piersonline/piersonline/piers.php?volume=3&number=5&page=718)

## Doctoral Thesis

**Xiaolan Xu**, “Electromagnetic Scattering Properties in Random Media and Its Application in Snow Remote Sensing,” University of Washington, 2011

## Conference Papers

**Xiaolan Xu**; Leung Tsang; Josberger, E.G.; , “Dense media radiative transfer theory for passive remote sensing and application to SWE Retrieval,” *Microwave Radiometry and Remote Sensing of the Environment (MicroRad), 2010 11th Specialist Meeting on* , vol., no., pp.110-115, 1-4 March 2010  
doi: 10.1109/MICRORAD.2010.5559578  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5559578&isnumber=5559522>

**Xiaolan Xu**; Ding Liang; Andreadis, K.M.; Leung Tsang; Josberger, E.G.; , “Comparison with CLPX II airborne data using DMRT model,” *Geoscience and Remote Sensing Symposium, 2009 IEEE International, IGARSS 2009* , vol.2, no., pp.II-148-II-151, 12-17 July 2009  
doi: 10.1109/IGARSS.2009.5418025  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5418025&isnumber=5417981>

Ding Liang; Leung Tsang; Simon Yueh; **Xiaolan Xu**; , “Modeling Active Microwave Remote Sensing of Multilayer Dry Snow using Dense Media Radiative Transfer Theory,” *Geoscience and Remote Sensing Symposium, 2008. IGARSS 2008. IEEE International*, vol.3, no., pp.III-39-III-42, 7-11 July 2008  
doi: 10.1109/IGARSS.2008.4779277  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4779277&isnumber=4779256>

Citation: 1

Leung Tsang; Ding Liang; **Xiaolan Xu**; Peng Xu; , “Microwave emission from snowpacks: modeling the effects of volume scattering, surface scattering and layering,” *Microwave Radiometry and Remote Sensing of the Environment, 2008. MICRORAD 2008* , vol., no., pp.1-4, 11-14 March 2008  
doi: 10.1109/MICRAD.2008.4579495  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4579495&isnumber=4579452>

Citation: 3

Ding Liang; **Xiaolan Xu**; Leung Tsang; Andreadis, K.M.; Josberger, E.G.; , “Modeling multi-layer effects in passive microwave remote sensing of dry snow using Dense Media Radiative Transfer Theory (DMRT) based on quasicrystalline approximation,” *Geoscience and Remote Sensing Symposium, 2007. IGARSS 2007. IEEE International* , vol., no., pp.1215-1218, 23-28 July 2007  
doi: 10.1109/IGARSS.2007.4423024  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4423024&isnumber=4422708>

Citation: 3

Yan, W.; **Xiaolan Xu**; Du, Y.; Sheng, F.; Li, Z.; Kong, J.; , “A Two-Scale Model for Composite Rough Surface Bistatic Scattering,” *Geoscience and Remote Sensing Symposium, 2006. IGARSS 2006. IEEE International Conference on* , vol., no., pp.2939-2941, July 31 2006-Aug. 4 2006  
doi: 10.1109/IGARSS.2006.755  
URL: <http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4241903&isnumber=4241146>

S. Huang, X. Duan, J. Ouellette, **Xiaolan Xu**, T. H. Liao, J. Johnson, M. Moghaddam, L. Tsang, “Like polarization and Cross polarization of Radar Remote Sensing of Soil Moisture at L band: 3D numerical simulations of Maxwell Equations, Analytical Models, and Retrieval Performance in Soil Moisture Retrieval,” *IEEE International Geoscience & Remote Sensing Symposium*, Vancouver, Canada, July 24-29, 2011.

**Xiaolan Xu**, L. Tsang, W. Chang and S. Yueh, “Electromagnetic Models of Like-Polarization and Cross-Polarization in Radar Remote Sensing of Terrestrial Snow at X- and Ku-band for applications in CoReH2O and SCLP,” *IEEE International Geoscience & Remote Sensing Symposium*, Vancouver, Canada, July 24-29, 2011.

Yueh, S. H.; Rott, H.; Nagler, T. F.; Cline, D. W.; Duguay, C. R.; Essery, R.; Etchevers, P.; Hajnsek, I.; Kern, M.; Macelloni, G.; Malnes, E.; Pulliainen, J. T.; Tsang, L.; Xu, X.; Marshall, H.; Elder, K., "Microwave Radar Retrieval of Snow Water Equivalent," American Geophysical Union, Fall Meeting 2010, abstract #C54B-03.

**Xiaolan Xu**, T. H. Liao, L. Tsang, S. B. Kim, E. Njoku, "Data Cube Representation of Vegetated Surfaces Based on Physical Scattering Model for SMAP Mission," Progress In Electromagnetics Research Symposium 2010, Suzhou, China, September 12-16, 2011.

**Xiaolan Xu**, L. Tsang, W. Chang, S. Yueh, "Electromagnetic Models of Like-polarization and Cross-polarization in Radar Remote Sensing of Terrestrial Snow at X- and Ku-band for CoReH2O and SCLP Application," Progress In Electromagnetics Research Symposium 2010, Suzhou, China, September 12-16, 2011.

**Xiaolan Xu**, T.H. Liao, L. Tsang, S. Huang, J.C. Shi, K.S. Chen, "Forward Models and Retrieval of Soil Moisture of Radar Remote Sensing of Bare Soil at L band Based on 3D Numerical Simulations of Maxwell Equations using both Like Polarization and Cross Polarizations," Progress In Electromagnetics Research Symposium 2011, Marrakesh, Morocco, March 20-23, 2011.

**Xiaolan Xu** et al. "SMAP mission: radar vegetated surfaces data cubes with comparisons to field data," URSI Commission F Microwave Signature 2010, Florence, Italy, October 4-8, 2010

**Xiaolan Xu**, S. Huang, L. Tsang, S. B. Kim, E. Njoku, "Data Cube Representation of Vegetated Surfaces Based on Physical Scattering Model for SMAP Mission," Progress In Electromagnetics Research Symposium 2010, Boston, USA, July 5-8, 2010.

**Xiaolan Xu**, L. Tsang, S. Huang, E. Njoku, "Microwave Scattering Model of Vegetated Surfaces for Applications in SMAP Mission," Progress In Electromagnetics Research Symposium 2010, Xi'an, China, March 23-26, 2010.

**Xiaolan Xu**, L. Tsang, S. Yueh, "Dense Media Radiative Transfer Theory for Active Remote Sensing and Applications to SWE Retrieval," IEEE International Geoscience & Remote Sensing Symposium, Hawaii, USA, July 25-30, 2010.

**Xiaolan Xu**, S. Huang, L. Tsang, S. Kim, E. Njoku, "Data Cube Representation of Vegetated Surfaces Based on Physical Scattering Model for SMAP mission," IEEE International Geoscience & Remote Sensing Symposium, Hawaii, USA, July 25-30, 2010.

Marco Tedesco, Hans-Peter Marshall, Nick Steiner, Edward Josberger, **Xiaolan Xu**, "Combining Active and Passive Microwave Data for Snow Parameters Retrieval with MultiSensor Snow Properties Measurements: The SAPS09 and GAPS10 Experiments," IEEE International Geoscience & Remote Sensing Symposium, Honolulu, Hawaii, USA, July 25-30, 2010.

**Xiaolan Xu**, L. Tsang, "Frequency and Polarization Dependence of Scattering in Bi-continuous Random Media Model with Application to Snow," Progress In Electromagnetics Research Symposium 2009, Moscow, Russia, August 18-21, 2009.

**Xiaolan Xu**, L. Tsang, "Physical Model of Microwave Remote Sensing of Snow Using the Bi-continuous Random Media Model," Progress In Electromagnetics Research Symposium 2009, Beijing, China, March 23-27, 2009.

**Xiaolan Xu**, K. H. Ding and L. Tsang, "Physical Model of Microwave Remote Sensing of Dry Snow using the Bi-continuous random Media," IEEE International Geoscience & Remote Sensing Symposium, Cape Town, South Africa, July 12-17, 2009.

(Second Prize, Student Paper Competition)

#### Conference/Workshop Poster

**Xiaolan Xu**, Simon Yueh, Eni Njoku, "Freeze/Thaw Detection Using Aquarius's L-band", JPL Postdoc Research Day, July 25, 2012.

Chi-yu Lin, **Xiaolan Xu**, Ben Livneh, L. Tsang, D. Lettenmaier, Ed. Josberger, "Assimilation of AMSR-E Snow Products in Mountainous Basins," American Geophysical Union, Fall Meeting 2011.

**Xiaolan Xu**, L. Tsang, Z. Gui, Ed. Josberger and L. Li, “Snow Retrieval Algorithm for Passive Microwave Remote Sensing Using Dense Media Radiative Transfer Theory,” IEEE International Geoscience & Remote Sensing Symposium, Honolulu, Hawaii, USA, July 25-30, 2010.

**Xiaolan Xu**, et. al, “Modeling active and passive microwave remote sensing of multilayer dry snow using a coupled snow hydrology-microwave model,” International Workshop on Microwave Remote Sensing for Land Hydrology Research and Applications, Oxnard, USA, October, 20-22, 2008.

## **PROFESSIONAL ACTIVITIES**

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- Reviewer, PIER & JEMWA, 2010
- Reviewer, IEEE Geoscience and Remote Sensing Letters, 2010
- Reviewer, IEEE International Geoscience and Remote Sensing Symposium, 2009 ~ 2012
- Reviewer, IEEE Transactions on Geoscience and Remote Sensing, since 2009
- Reviewer, Proceedings of the IEEE, since 2009

## **MEMBERSHIP**

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- Member, American Geophysical Union
- Member, National Postdoctoral Association
- Member, American Association for the Advancement of Society (AAAS)
- Member, IEEE Geoscience & Remote Sensing Society
- Member, Institute of Electrical and Electronics Engineers (IEEE)
- Student Member, IEEE, 2008~2011

## **HONORS/AWARDS**

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|---|----------------|
| • Second Prize, Student Paper Competition, IEEE International Geoscience and Remote Sensing Symposium | 2009           |
| • Excellent Student Scholarship, Zhejiang University  | 2003/2004/2005 |
| • Excellent Student Leader, Zhejiang University   | 2003/2004/2005 |
| • Scholarship for Creative Activity, Zhejiang University  | 2005           |
| • Third Prize in National Collegiate Mathematical Modeling Competition                                | 2004           |
| • First Prize in High School National Biology Competition   | 2000           |